

WHAT IS CLAIMED IS:

- 1 1. A method for real time determination of emulsion in a formation fluid comprising:
2 (a) positioning an optical probe, having a probe surface which can measure changes in
3 total internal light reflectance, such that the probe surface is in contact with a formation
4 fluid, wherein the probe and its surface are composed of material which can withstand
5 an extended period in contact with the formation fluid; (b) measuring the total internal
6 light reflectance at the probe surface; and (c) determining in real time therefrom whether
7 an emulsion is present or the degree of emulsification at such surface.

- 1 2. The method of Claim 1 wherein the optical probe is an attenuated total
2 reflectance probe.

- 1 3. The method of Claim 2 wherein the attenuated total reflectance probe includes a
2 photometer that measures light in a wavelength range of from about 400 to about 1500
3 nm.

- 1 4. The method of Claim 3 wherein the photometer measures light in a wavelength
2 range of from about 640 to about 680 nm.

- 1 5. The method of Claim 1 wherein the formation fluid is in a pipeline or in a free
2 water knock-out.

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4 6. A method for controlling emulsion formation in a formation fluid comprising: (1)
5 placing an optical probe, having a probe surface which can measure changes in total
6 internal light reflectance thereat, in contact with a formation fluid; (2) measuring the
7 changes in total internal light reflectance at the probe surface; (3) determining in real
8 time the presence of emulsion in the formation fluid as a function of the changes in total
9 internal light reflectance; (4) comparing the determination of (3) to a predetermined
10 maximum acceptable emulsion presence; and (5) effecting a change in the rate of
11 addition, if any, to the formation fluid of an additive effective to reduce the emulsion
12 presence; wherein: (a) the optical probe is composed of a material which can withstand
13 an extended period of contact with the environment to which it is exposed; and (b) the

14 rate of addition, if any, to the formation fluid of a demulsification additive is: (i) increased
15 when the emulsion presence is greater than the predetermined maximum acceptable
16 emulsion presence; (ii) decreased or maintained when no emulsion is detected or when
17 the emulsion presence is less than the predetermined maximum acceptable emulsion
18 presence.

1 7. The method of Claim 6 wherein the optical probe is an attenuated total
2 reflectance probe.

1 8. The method of Claim 7 wherein the optical probe is located in a pipeline or free
2 water knock-out.

1 9. The method of Claim 8 wherein two or more attenuated total reflectance probes
2 are located in a free water knock-out.

1 10. The method of Claim 7 wherein the attenuated total reflectance probe includes a
2 photometer capable of measuring light in a wavelength range of from about 400 to about
3 1500 nm.

1 11. The method of Claim 10 wherein the photometer is capable of measuring light in
2 a wavelength range of from about 640 to about 680 nm.

1 12. The method of Claim 6 wherein the demulsification additive is an alkyl phenol
2 resin.

1 13. A system for controlling emulsion formation in a formation fluid comprising a fluid
2 flow path for flowing formation fluid recovered from a subsurface formation; an optical
3 probe, having a probe surface which can measure changes in light reflectance at the
4 probe surface, in contact with the formation fluid; a processor associated with the optical
5 probe enabling collection of data therefrom, such data corresponding to the presence of
6 emulsion or degree of emulsification in the formation fluid; and a controller associated
7 with the processor enabling translation of data therefrom to initiate action to modify the
8 presence of emulsion or degree of emulsification.

1 14. The system of Claim 13 further comprising an automated probe surface cleaning
2 device capable of extracting, cleaning, calibrating and inserting or reinserting the probe
3 surface.

1 15. The system of Claim 13 wherein the optical probe is an attenuated total
2 reflectance probe.

1 16. The system of Claim 13 wherein the fluid flow path further comprises a free water
2 knock-out and the optical probe is located in the free water knock-out.

1 17. The system of Claim 16 wherein at least three optical probes are located inside
2 the free water knock-out having an oil outflow pipeline and a water outflow pipeline, at
3 positions such that a first probe is at or adjacent to the level of the oil outflow pipeline, a
4 second probe is at or adjacent to the level of the water outflow pipeline, and a third
5 probe is between the oil outflow pipeline and the water outflow pipeline.

1 18. The system of Claim 13 wherein the optical probe is an attenuated total
2 reflectance probe.

1 19. The system of Claim 17 wherein the optical probes are attenuated total
2 reflectance probes.

1 20. The system of Claim 12 wherein the processor and controller are incorporated
2 into a single unit.